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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/596,280	06/08/2006	Yasuo Fukuda	P30037	4880

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EXAMINER	
RAO, G NAGESH	
ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
06/25/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/596,280	FUKUDA ET AL.	
	Examiner	Art Unit	
	G. NAGESH RAO	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 April 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *6,8,10,13-15,19 and 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6,8,10,13-15,19 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1) Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 refers to the contact angle with respect to the surface of the wafer (be it the water repellent or hydrophilic surface), however it is not clear what the contact angle of the surface is alluding too? Is it with respect to the film deposited on the wafer thereafter or in connection to a means of contact to the surface of the wafer? Clarity on the scope and definitiveness of these claims would be greatly appreciated.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2) Claims 6 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dietze (US Patent No. 6,454,852) in view of Brabant (US Pg Pub 2003/0036268), in further view of Tanaka (US Patent No. 6,239,045).

Dietze 852 pertains to the method of making an epitaxial wafer with silicon wafer including the following steps:

A first cleaning process of the wafer surfaces (which inherently means and includes the top and bottom surface of the wafer) with a SC-1 and SC-2 cleaning process aka RCA cleansing process (See Col. 9 Lines 45-50). As well thereafter the teachings of including a step of epitaxial deposition on the cleaned and polished Si substrate (See Col. 9 Lines 58-68 as well Figure 1).

However Dietze 852 does not adequately disclose subsequent cleaning processing steps that occur after the SC-1 and SC-2 cleaning process, referred to as second and third cleaning steps.

In the same field of endeavor pertaining to semiconductor processing of epitaxial wafers utilizing an RCA Process of cleansing, Brabant 268 discloses in the prior art that it is known to employ a generally optional "HF last" step by dipping the Si wafer into the hydrofluoric acid solution, which would enable the wafer to have a water repellent surface as a result of the "HF" dipping. Examiner notes that applicants have claimed steps two and three of the cleaning to employ the use of a HF or BHF solution as noted in dependent claims 5 and 13-15, which would therefore inherently enable the Si wafer to form a water repellent surface, since it results from the exposure to the HF solution. Furthermore cleaning steps

two and three are employed simultaneously and require the same solution for processing the wafer (See Sections 0010-0012).

It would be obvious to one having ordinary skill in the art at the time of the invention to employ the use of a HF solution as a subsequent cleansing step following the RCA cleansing process before growth of the epitaxial film on the Si wafer, in order to aid in preventing oxidation on the surface of the wafer by creating the hydrogen-terminated surface (i.e. water repellent). It is also obvious to notate that the second and third cleansing steps are one and the same thing, and to denote it as such rather than as a one single step is based on rationale that an extended or followup cleansing may be desired for allowing for more optimal and effective processing means of a higher quality epitaxial wafer.

However the combined hypothetical teachings of Dietz 852 and Brabant 268 does not adequately disclose subsequent cleaning processing steps that occur after the SC-1 and SC-2 cleaning process, referred to as the continuous hydrophobicating and hydrophilicating cleaning steps, as well the process of allowing for one surface to be water repellent and the other surface to be hydrophilic.

In the same field of endeavor pertaining to semiconductor processing of epitaxial wafers utilizing an RCA Process of cleansing, Tanaka 045 does disclose

that it is known to incorporate a variety of cleansing steps (which would encompass a fifth and sixth step after the fourth step (initial step) and able to be performed simultaneously) before and after epitaxial deposition film growth on the Si wafer utilizing not only the RCA cleansing step but also incorporating the use of a HF solution for eliminating oxide films (allowing for the creation of a water repellent surface) as well an "O_3 + Water" cleansing step allowing for a hydrophilic surface to be created (See Figures 5-6 and Col 1 Lines 55-68, Col 2 Lines 1-35, Col 4 Lines 1-44).

It would be obvious to one having ordinary skill in the art at the time of the invention to employ the teachings of Tanaka 045 with that of hypothetical teachings of Dietz 852 and Brabant 268, in the use of a HF solution and a "O_3 + Water" as subsequent cleansing steps following the typical RCA cleansing process before growth of the epitaxial film on the Si wafer, in order to aid in preventing oxidation on the surface of the wafer by creating the hydrogen-terminated surface (i.e. water repellent) as well be able to create alternatively a hydrophilic surface. It is also obvious to notate that the fifth and sixth cleansing steps are one and the same thing employing a repetition of steps, and to denote it as such rather than as a one single step is based on rationale that an extended or followup cleansing may be

desired for ultimately allowing for more optimal and effective processing means of a higher quality epitaxial wafer.

3) Claims 10, 15 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dietze (US Patent No. 6,454,852) in view of Brabant (US Pg Pub 2003/0036268), in further view of Tanaka (US Patent No. 6,239,045) in further view of Sato (US Patent No. 6,942,737).

From the aforementioned hypothetical combination, Dietze 852, Brabant 268, and Tanaka 045 disclose an efficient and definitive processing technique for the cleansing and fabrication of an epitaxial wafer.

However the prior art fails to disclose the use of a sponge brush in conjunction with the "O_3 + Water" solution of the sixth cleansing step directed towards one of the surfaces of the Si wafer substrate.

In the same field of endeavor pertaining to substrate cleansing and processing, Sato 737 discloses the use of a sponge brush in conjunction with a water solution in order to provide for a more efficient cleansing means (See Abstract, Col 1 Lines 8-40 and Col 5 Lines 13-30).

It would be obvious to one having ordinary skill in the art at the time of the present invention to employ the technique disclosed in Sato 737 with that of the hypothetical combination of Dietze 852, Brabant 268, and Tanaka 045 in order to employ for a more effective and efficient cleansing means of the substrate in fast and predictable manner.

Response to Arguments

4) Applicant's arguments filed 4/23/09 have been fully considered but they are not persuasive. Upon review of applicants remarks on claim 8's 112 rejection, the remarks presented were applicable to claim 6, but no clear rationale was explained as to how claim 8 as amended denotes what is being implied about the angles. Applicant pointed to specification, but the content there was open for interpretation as well it's not written into the claim itself. Examiner respectfully requests clarity as to what is denoted in claim 8.

With respect to the prior art rejections on the currently amended claims, examiner appreciates the clarity applicants have provided in what is to be understood by the "cleaning steps", but begs to question how this technique differs from the known prior art pertaining to epitaxial wafer cleansing? The art denotes relevant teachings in producing and preparing epitaxial wafers with known SC-1

and SC-2 processes and various chemical additives for hydrophobicating and – philicating the sides of the wafer. The claims presented amount to basically a repetitive processing of the wafer, which is obvious to one having ordinary skill in the art as a recognized repetitive processing for higher quality technique to buff out any irregularities in the material.

Applicants need to provide a showing as to why the claimed invention differs in obviousness as accorded to the combined prior art, there's analogous references, motivation based on benefits resulting from the techniques utilized, and the ability to achieve a better product as a result of the process implemented.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened

statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to G. NAGESH RAO whose telephone number is (571)272-2946. The examiner can normally be reached on 8:30AM-5PM (INDEPENDENT FLEX SCHEDULE).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MIKHAIL KORNAKOV can be reached on (571)272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/G. Nagesh Rao/
Patent Examiner GAU-1792

/Robert M Kunemund/

Primary Examiner, Art Unit 1792